
Space Weather Technical Forecast

Issued on Saturday, 05 November 2022 at 01:27 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Low risk of G1/Minor Storms early on 05 November. Active fluence (1e8 integrated pfu) expected to continue through much of the period.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low through the last 24 hours, with one significant C-class flare, a C5.6 flare from AR3141 on the northeastern limb. This region is continuing to reveal greater complexity as it rotates onto the visible disc. Much of the development in sunspot regions has been from four growing, but generally uncomplex regions in the northeast quadrant. An exception to this uncomplex trend is AR3137, which appears to have developed a Beta-Gamma configuration. The two large regions in the northwest quadrant, AR3131 and AR3135 appear to be either stable or weakening. A remaining region in the southeast is weak and simple. No significant Earth-directed CMEs have been identified in recent imagery, with the CME emerging from AR3136 near centre disk yesterday expected to miss below Earth's orbit. A further filament lift-off earlier on 04 November from the southeast disc is yet to be analysed.

Solar Wind / Geomagnetic Activity: The solar wind, observed by DSCOVR at L1, is showing an ongoing but declining influence from coronal hole 39 with speeds declining from 575km/s to 500km/s. Density was just above average. Total magnetic field strength, IMF, has been weak with a declining trend. The north-south component, Bz has varied weakly, with a negative bias. Phi angle has been resolutely positive (away from the Sun) through the period. Geomagnetic activity was Active until 04/1200UTC but has been Unsettled since.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured at GOES-16 has remained at background levels. High energy electron flux (greater than 2 MeV) at GOES-16 has increased from moderate to high levels, reaching a peak of 5.87e3 pfu at 04/1815UTC. Electron fluence levels have steadily increased and have now reached 2.1e8 integrated pfu.

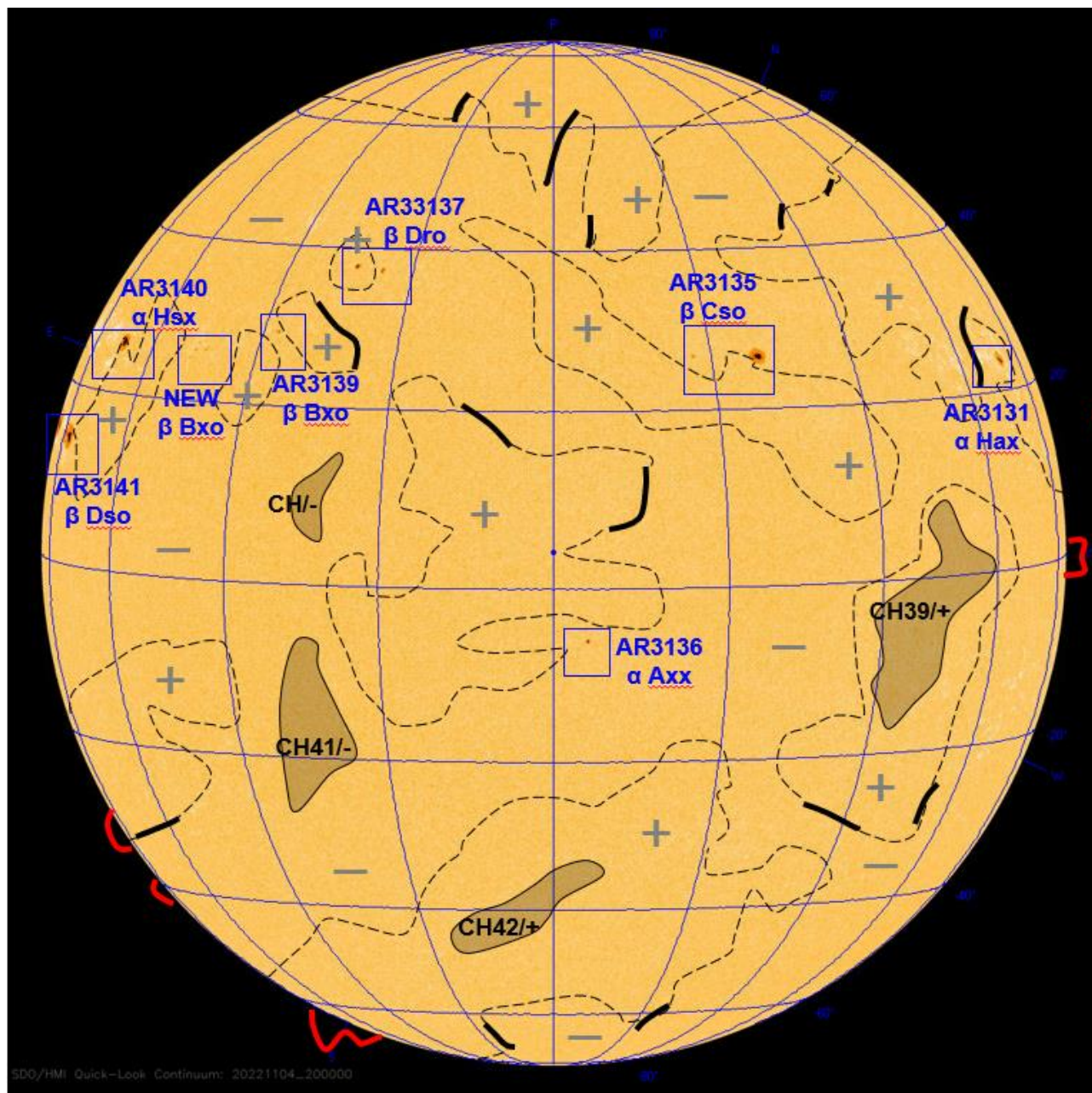
Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is forecast to be mainly Low, with a slight but increasing chance of Moderate activity due to developing regions on the visible disc. There is also a risk from potentially complex regions rotating onto the disc from the farside of the Sun.

Solar Wind / Geomagnetic Activity: No Earth directed CMEs are forecast. The high speed stream from coronal hole 39 is expected to decline to background levels by the end of 06 November. Coronal hole 42 may then connect with the Earth either later on 07 November or during 08 November, although there is low confidence in the strength of any connection. Geomagnetic activity is expected to be mainly Quiet to Unsettled, but there is a slight chance of Active or G1/Minor Storm intervals early on 05 November and then a chance of Active intervals late on 07 or early on 08 November.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) observed by GOES-16 is expected to be at background levels. High energy electron flux (greater than 2MeV) is expected to remain mainly above the high threshold through much of the period, with a declining trend and brief sharper drops and recoveries due to the diurnal orbital cycle. Electron fluence values are expected to remain above the Active (1e8 integrated pfu) threshold through the period due to elevated electron flux values.

Figure 1. Solar Analysis Valid 04/2000UTC.



Key: Filament ____, Prominence ____, Magnetic Field Line - - -, Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α - β - $\beta\gamma$ - $\beta\gamma\delta$ and Zurich-McIntosh Axx etc.

Geomagnetic Storms:

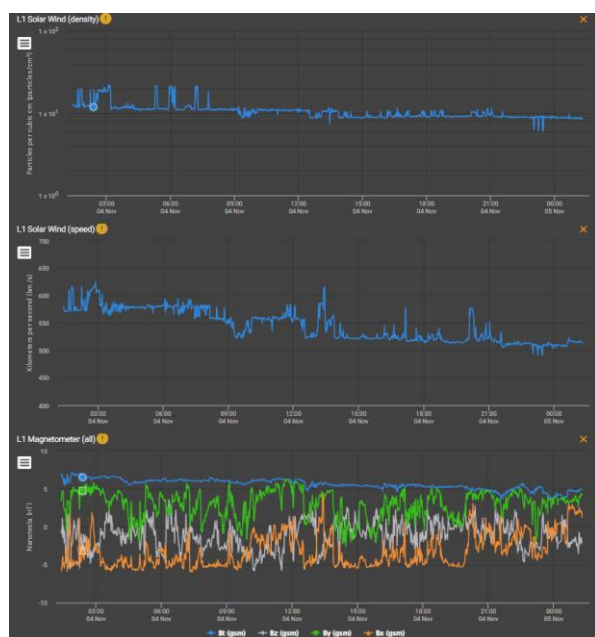
No Earth-directed CMEs are forecast.

Earth is currently under the influence of a high speed stream from coronal hole 39, with speeds averaging between 500-600km/s. Speeds are declining and are expected to reach background levels by 06 November. Coronal hole 42, in the southern hemisphere is forecast to connect with the Earth either late on 07 November or during 08 November, with speeds of around 500km/s estimated.

Geomagnetic activity is expected to be mainly Quiet to Unsettled, with a slight risk of Active and a very slight chance of G1/Minor Storms at first on 05 November. Mainly Quiet to Unsettled conditions are forecast through 06 and 07 November, then a chance of Active intervals later on 07 or during 08 November as the next coronal hole high speed stream connects with the Earth.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	10	1	10	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: Recent solar wind parameters at L1.



Radio Blackouts - X-Ray Flares:

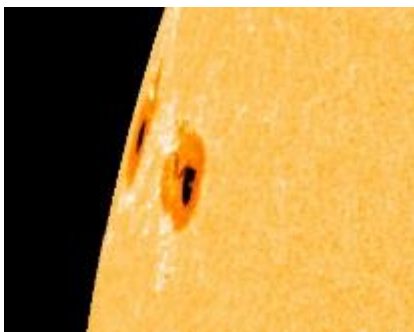
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There are eight sunspot regions on the visible disc, with two mature and generally inactive regions in the northwestern quadrant. The most notable development has been from AR3141 very close to the limb, with two large spots as part of an increasingly complex bipolar region. Far side imagery indicates that further complex regions are due to rotate onto the visible disc through the next four days.

Solar activity is forecast to be mainly Low or Very Low, but with a risk of Moderate activity, especially from the regions in the northeast quadrant.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	15	15	15	15
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: SDO HMI intensitygram imagery of the merging region AR3141 on the northeast limb



Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) at GEO, observed by GOES-16 is currently

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at background levels and is forecast to remain at this level through the guidance period.

Radiation Storms	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{s}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq \text{S1}$	No	1	1	1	1
Very Active	$\geq \text{S3}$ *	No	1	1	1	1

* S3 $\geq 10 \text{ MeV} \geq 1000 \text{ pfu}$ and / or $\geq 50 \text{ MeV} \geq 10 \text{ pfu}$. (pfu = $\text{cm}^{-2} \text{sr}^{-1} \text{s}^{-1}$)

High Energy Electrons Event ($\geq 2 \text{ MeV}$):

The high energy electron flux (greater than 2MeV) has risen from moderate to high levels with this likely to remain elevated due to the recent input into the radiation belts. This is only likely to decrease slowly through the next four days, with no significant geomagnetic activity expected. Brief declines are possible due to diurnal variations, but these are unlikely to be sustained.

Electron fluence has risen sharply in response to the increase flux and is expected to remain above the Active threshold (1×10^8 integrated pfu) for much of the period. The risk is considered lower towards the end of the period simply due to reduced confidence in any geomagnetic activity and rate of electron losses in the radiation belts.

GEO Electron Environment	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{day}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^8$	No	100	80	70	50
Very Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^9$	No	1	1	1	1